

The Infrared Spectrograph on the Spitzer Space Telescope

Thomas L. Roellig – NASA Ames Research Center
For the Spitzer IRS Development Team

Abstract

The Infrared Spectrograph (IRS) instrument on the Spitzer Space Telescope covered the 5 to 38 micron wavelength range at low and medium spectral resolutions. The instrument was very popular during Spitzer's 5.7 year-long cold mission. Every year it attracted the most proposals, and garnered more observing hours, of any of the science instruments. This success was the culmination of a very long development period, where the instrument design changed radically. When the instrument was first selected by NASA in 1984 it was very complicated. As part of the overall reduction of the size of the SIRTf Observatory following its recovery from the mission's cancellation in 1991 the IRS became smaller and much, much simpler. The only aspect of the instrument that increased from the original design was the pixel count of the detectors.

Jim Houck, the IRS Principal Investigator, designed the new, lean, IRS based on eight axioms:

- SIRTf is a cost-driven mission
- Only Boeing Si:As and Si:Sb 128x128 BIB arrays shall be used
- The IRS has all Aluminum housing and optics
- Simple optics consisting of surfaces of revolution, flat gratings, and "bolt-and-go" tolerances
- No moving parts
- Redundancy only for credible single-point failures
- Strive for an observing efficiency of 80%
- The IRS shall be capable of internal health assessment

This led to a simple, robust, but still extremely powerful final instrument composed of four distinct modules. Many of the features developed for the IRS were subsequently employed in other spacecraft and SOFIA science instrumentation.

This introductory talk will cover the developmental history of the IRS instrument, its final design and performance, and will especially highlight the sage decisions that Jim Houck made along the way that led to its highly successful career on the Spitzer Space Telescope.